University of Gdańsk

Subject card

Subject name and code	Practical use of HPLC, PG_00170422		
Field of study	Chemistry		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
Education level	Bachelor's studies	Subject group	Optional subject group
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit	Department of Bioinorganic Chemistry -> Faculty of Chemistry -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Dawid Dębowski	
	Teachers	dr hab. Aleksandra Dąbrowska mgr Aleksandra Ciesielska	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	30	4.0	26.0	60

Subject objectives	Understanding the theoretical foundations of HPLC and UHPLC. Practical skills in operating UHPLC. Sample preparation for analysis. Conducting HPLC analyses. Optimization of analytical conditions. Troubleshooting analytical problems. Documentation and reporting of results. Safety in the HPLC laboratory. Ethics in laboratory work.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEML3_K06] Raises her/his professional and personal competences by using information provided in various sources.	(1) Actively seeks new sources of knowledge to enhance professional competencies and develop skills in liquid chromatography; (2) Shares acquired information with other members of the laboratory team, supporting them in the development of their professional competencies; (3) Takes initiative in self-education and improving professional skills by utilizing available educational tools.	[SK4] test/exam - oral or written
[CHEML3_K05] Observes established procedures in laboratory work and is responsible for the safety of her/his and others' work.	(1) Ensures adherence to safety and hygiene rules in the laboratory team, promoting responsible behavior among colleagues; (2) Approaches laboratory work responsibly, maintaining order and following procedures, which ensures the safety of all team members; (3) Responds to hazardous situations and collaborates in solving safety-related issues in the laboratory.	[SK4] test/exam - oral or written
[CHEML3_K04] Respects and appreciates the importance of intellectual property in her/his actions and in the actions of others; acts ethically.	(1) Respects the contributions of their own work and others in the development of chromatographic methods and analytical research; (2) Demonstrates responsibility for the accuracy of the presented results and the transparency of the research process; (3) Follows the principles of good laboratory practice and ethical standards applicable in scientific and industrial work.	[SK4] test/exam - oral or written
[CHEML3_K01] Identifies the level of her/his own knowledge and skills and the need for continuous learning and personal development.	(1) Demonstrates openness to acquiring new knowledge and improving skills in the field of HPLC; (2) Critically analyzes their own achievements and research results, recognizing opportunities for improvement and optimization of analytical methods; (3) Understands the importance of continuous education for professional development in the chemical, pharmaceutical, biotechnology, and environmental industries.	[SK2] presentation/project/paper/ report [SK6] demonstration of practical skills [SK8] observation of student's independent or team work
[CHEML3_U07] Prepares documented elaboration on a specific problem in the field of selected chemical and physical issues.	(1) Prepares a comprehensive report or laboratory summary of HPLC experiment results; (2) Analyzes and interprets the obtained chromatograms, presenting them in a clear and understandable manner for the audience; (3) Formulates conclusions based on the conducted experiments and chromatographic analysis results; (4) Uses appropriate software tools to process and visualize chromatographic data.	[SU2] presentation/project/paper/ report [SU6] demonstration of practical skills [SU8] observation of student's independent or team work
[CHEML3_U04] Plans and performs simple chemical experiments and analyses the results obtained.	(1) Independently plans and conducts chromatographic experiments, selecting appropriate analysis conditions; (2) Optimizes HPLC parameters to achieve the best resolution and sensitivity in the analysis; (3) Analyzes the obtained chromatograms, identifies the substances being analyzed, and evaluates their concentration; (4) Identifies errors in HPLC experiments and proposes methods for their elimination; (5) Prepares reports of the conducted analyses, formulating conclusions based on the obtained results.	[SU2] presentation/project/paper/ report [SU6] demonstration of practical skills [SU8] observation of student's independent or team work

Course outcome	Subject outcome	Method of verification
[CHEML3_U03] Selects the appropriate equipment and laboratory apparatus for conducting uncomplicated chemical experiments.	(1) Selects appropriate chromatographic equipment and analysis conditions depending on the type of substances being analyzed and the goal of the experiment; (2) Configures the HPLC apparatus and optimizes operational parameters such as mobile phase composition, flow rate, column temperature, and detection wavelength; (3) Analyzes the impact of equipment selection on the quality and accuracy of chromatographic results; (4) Performs basic maintenance and diagnostics of the HPLC equipment, preventing errors in the analysis.	[SU2] presentation/project/paper/ report [SU6] demonstration of practical skills [SU8] observation of student's independent or team work
[CHEML3_U02] Performs analyses using experimental methods and draws conclusions based on them.	(1) Independently performs qualitative and quantitative analyses using the HPLC method; (2) Develops and optimizes chromatographic analysis conditions depending on the sample being analyzed; (3) Interprets chromatograms, identifies the substances being analyzed, and evaluates their concentration based on the obtained results; (4) Recognizes analytical errors and proposes methods for their elimination; (5) Formulates conclusions based on the conducted analyses, considering the accuracy and repeatability of the results.	[SU2] presentation/project/paper/ report [SU6] demonstration of practical skills [SU8] observation of student's independent or team work
[CHEML3_W10] Enumerates and describes the basic aspects of the construction, operation and use of measuring apparatus and equipment used in experimental works in the field of chemistry and related sciences.	(1) Names and describes the components of HPLC equipment (pump, injector, chromatographic column, detector, data acquisition system); (2) Explains the working principle of high-performance liquid chromatography (HPLC) and the function of each component of the system; (3) Characterizes different types of stationary and mobile phases used in HPLC and their impact on the separation process; (4) Describes the types of detectors used in HPLC (e.g., UV-Vis, fluorescence, MS) and their applications in the analysis of different chemical compounds.	[SW4] test/exam - oral or written
[CHEML3_W04] Characterises the basic methods of chemical compound analysis.	(1) Characterizes the principles of high-performance liquid chromatography (HPLC) and its applications in chemical analysis; (2) Describes sample preparation methods for HPLC analysis and the selection of appropriate stationary and mobile phases; (3) Presents different detection techniques used in HPLC (e.g., UV-Vis, fluorescence, MS) and their applications in the analysis of chemical compounds; (4) Explains the impact of chromatographic parameters on the quality of separation and identification of analytes.	[SW4] test/exam - oral or written
[CHEML3_K02] Works individually demonstrating initiative and independence of activity and cooperates in a team fulfilling various roles in it.	(1) Demonstrates initiative in improving chromatographic analysis methods and seeking new solutions; (2) Approaches teamwork responsibly, ensuring the precision of results and the effectiveness of collaboration; (3) Adheres to professional ethics and scientific integrity in both individual and team-based research work.	[SK4] test/exam - oral or written

	Course outcome	Subject outcome	Method of verification
	[CHEML3_W03] Explains the relationship between the structure of matter and its observed properties.	(1) Explains the principles of HPLC and the mechanisms of chemical compound separation; (2) Describes the structure and operation of the HPLC system and the importance of its individual components; (3) Analyzes the impact of chromatographic parameters (mobile phase, stationary phase, temperature, flow rate) on separation efficiency; (4) Understands the relationships between the physicochemical properties of compounds and their retention in the HPLC system.	[SW4] test/exam - oral or written
Subject contents	Introduction to HPLC. Preparation of samples for analysis. Configuration and calibration of the HPLC apparatus. Conducting HPLC analyses. Optimization of analytical conditions. Detection and interpretation of results. Troubleshooting of analytical problems. Documentation and reporting of results. Safety and hygiene in the HPLC laboratory. Practical applications of HPLC.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	test (theory)	51.0%	50.0%
	test (practice)	51.0%	50.0%
Recommended reading	Basic literature	1. M. Dong, *HPLC and UHPLC for Practicing Scientists,* Wydawnictwo Blackwell Science (2019). 2. L. E. Reubseat, G. Tyge, 2. Chromatography, Wydawnictow Wiley Vch Verlag Gmbh (2019). 3. R. Rosset, H. Kołodziejczyk, *Współczesna chromatografia cieczowa, ćwiczenia i zadania*, Wydawnictwo Naukowe PWN (2000). 4. D. Corradini, T.M. Philips, Handbook of HPLC, CRC Press (2011).	
	Supplementary literature	1. References recommended by the lecturer. 2. Exercise instructions.	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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